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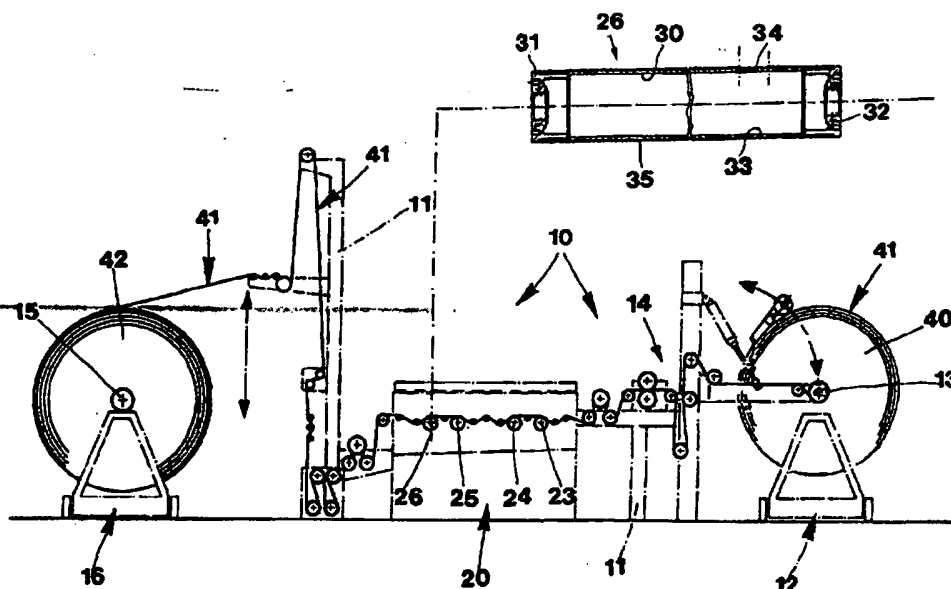
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OF TEXTILE FABRICS USING ROLLERS COATED WITH DIAMOND POWDER



(57) Abstract

Mechanical process, rollers and machines (10) for obtaining continuous modification of the appearance and colour of textile fabrics by passage, dry or wet, of the fabric (41) under tension, around rollers (23-26) with a coating (35) of diamond powder, uniformly or in areas marked out in their surfaces.

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MECHANICAL PROCESS, WET OR DRY, TO OBTAIN CONTINUOUS
CHANGES IN APPEARANCE AND COLOUR OF TEXTILE FABRICS
USING ROLLERS COATED WITH DIAMOND POWDER

The invention concerns the processes, machines and
5 equipment for changing the appearance and colour of
textile fabrics to secure effects some of which may
be special.

Machines and processes for altering the appearance and
colour of fabrics generally are well known in the trade.
10 These changes may be brought about by chemical or mech-
anical methods.

If the process is mechanical the machines used are those
for lapping or finishing; they comprise lapping rollers,
generally working dry, around which a fabric, stretched
15 under tension, is passed by unwinding it from one roller and
winding it, after lapping, onto another.

The lapping rollers have an abrasive coating, the type
of grain used being decided by the desired result.

The coating consists of abrasive granules fixed onto a
20 suitable support.

If the process is chemical the methods used are limited
in the effects they produce and may damage the fabrics.

Mechanical methods using rollers coated with abrasive granules raise many problems because of low efficiency, of the need for frequently redressing the abrasive layer, of the unevenness of results and because of obtaining
5 effects which often are not those required.

Purpose of the invention is to provide a process for wet and dry lapping or finishing which offers considerable advantages compared with present processes both because of the effects obtained on all types of textile fabrics
10 and because of its high production efficiency as will be explained below.

Subject of the invention is a process for continuous modification of surface appearance and colours on fabrics generally, in which process the fabric passes, stretched
15 under tension, round a set of lapping rollers, the working surfaces of which carry a coating of diamond powder.

The diamond powder is applied to the surface of the roller by electrodeposition.

Shapes and sizes of the granules forming the diamond powder
20 are chosen according to the desired abrasive action.

The fabric can be treated dry or wetted.

For wet treatment, before its passage round the abrasive rollers, the fabric passes through a bath of liquid.

The liquid may be water or may contain substances which,
25 combined with the abrasive action, produce special effects on the treated fabric.

The working surface of the rollers may be divided up into areas of different shapes and sizes with intervals between one such area and another making the abrasive action more
30 powerful due to the edges, which may be sharp, of the areas raised in relation to the spaces, facilitating discharge of particles removed and easier distribution of the liquid

if the fabric is being treated wet.

The spaces may be strips with no diamond powder or even grooves in the surface of the rollers, with or without diamond powder, according to circumstances and preferences.

- 5 Also as circumstances require, the strips or grooves may be longitudinal or annular, placed at the same or different centre distances, the purpose of this being to produce on the fabric treated areas separated from untreated areas. The strips or grooves may be one or more helical pairs.

- 10 These pairs may lie in opposite directions and cross over. This produces excellent discharge flows of detached particles or dispersion of liquid if the treatment is wet. The strips or grooves may be partly longitudinal and partly annular, freely crossing one over another.

- 15 Some rollers are motor-driven.

The number of rollers coated with diamond powder around which the fabric passes, and similarly the speed of one or other of the rollers, may be varied at will according to the effects it is desired to obtain.

- 20 The direction of rotation can be reversed for some or all rollers according to previously set stages of work.

Clearance angle between fabric and rollers may be varied in accordance with the results to be produced.

Fabric tension can be varied as preferred to obtain that

- 25 ~~which is most suitable for the purpose.~~

The speed at which the fabric moves can also be varied.

Action of the diamond coated rollers can be simultaneous on both sides of the fabric.

- 30 All working parameters chosen can be memorized in an electronic programmer so that they can be repeated.

The foregoing clearly shows that the present invention gives rise both to a new process, to new rollers and to new

machines which, with the new rollers, make possible a new process.

The invention offers evident advantages.

The use of rollers coated with diamond powder permits
5 an excellent treatment to be given with maximum output efficiency, maximum variety of action on all types of textile fabrics, and offers the possibility of repeating as desired the effects that have been programmed.

Processing can be not only dry but also wet causing no
10 furring, and can be carried out on dyed and printed fabrics, on denim types and all done without chemicals.

Any type of fabric can be treated, thin or thick, of natural or synthetic fibres, cotton, wool, viscous, linen, polyester, polyamide, cupro/rayon, nylon, imitation
15 leather and every other type used.

Processing can be carried out simultaneously on both sides of the fabric.

Maximum consistency of effects over time is assured, as coaxiality of granules ensured by diamonds over the whole
20 length of the lapping rollers, remains unaltered until completely worn down, within three/four hundredths at least.

Overall efficiency of the machine whose rollers have a diamond granule coating, is several times greater compared
25 with present methods using common types of abrasives.

There is no need for the redressing generally required.

The possibility of using the best number of lapping rollers to suit the work required, gives a very high output and greater effects made possible by the fact that the rollers
30 can also move in the transversal direction.

To sum up these advantages the strong and steady abrasive power of diamond powder realizes dry or wet lapping able

to produce any effect desired on any textile fabric at a rate of output decided at will according to quantities required. This applies not only to a uniform all-over treatment of the fabric but also to the unlimited possibilities of patterns between treated areas, untreated areas and others treated differently, all due to what can be achieved with diamond powder coated rollers in which there is a variety of strips and grooves.

Characteristics and purposes of the invention will become still clearer on seeing the following examples of its execution illustrated by diagrammatically drawn figures.

Fig. 1 Machine, seen in perspective, for dry or wet lapping with lapping rollers, subject of the invention.

Fig. 2 Lateral diagrammatic view of the lapping machine.

Fig. 3 Lateral cross section showing a detail of the structure of a lapping roller, according to the invention, whose surface is entirely coated with diamond powder.

Fig. 4 Perspective view showing a detail of a roller whose working surface is divided by smooth longitudinal strips.

Fig. 5 Perspective view showing a detail of a roller whose working surface is divided by smooth longitudinal grooves.

Fig. 6 Perspective view showing a detail of a roller whose working surface is divided by smooth annular strips.

Fig. 7 Perspective view showing a detail of a roller whose working surface is divided by helical grooves.

Fig. 8 Perspective view showing a detail of a roller whose working surface is overrun by a pair of helical grooves in opposite directions that cross each other.

Fig. 9 Detail of a roller in whose working surface are smooth longitudinal and annular strips that cross over.

The lapping machine 10 for textile fabrics comprises the base 11 with initial support 12 to sustain the rotating roller 13 on which is wound the roll 40 of fabric 41 to be treated.

5 Having passed a set of transmission units 14 and a bath of liquid, the stretched fabric passes through the set 20 of four lapping rollers 23-26 after which, treated and wrung out, it winds onto the roller 15 on the support 16 where it forms the roll 42 of treated fabric.

10 The lapping rollers like 26 in Fig.3 comprise a metal tube 30 supported at its ends by drums 31 and 32. On the outside of the tube a laminated sheet 33 is laid, with its surface 34.

A layer 35 of diamond granules and powder is applied by 15 electrodeposition to said laminated sheet.

These diamond granules carry out the function of thousands of single tools; they ensure high precision, strong abrasive power and long life.

Abrasive action obviously depends on granule size.

20 The fabric can be kept wet after passing through the humidifying bath and is kept constantly pulled.

The roller 50 in Fig.4 has a working surface coated with diamond powder 60 divided up by smooth strips 42.

In Fig.5 the working surface 61 of the roller 51 is divided up by longitudinal grooves 71. 25

The working surface 62 of the roller 52 in Fig. 6 is divided up by a series of smooth annular strips 72.

The working surface 63 of the roller 53 in Fig. 7 is divided up by a smooth helical strip 73.

30 In Fig. 8 the working surface of the roller 50 is divided up by a pair of smooth helical grooves 74 and 75 lying in opposite directions, one crossing the other.

Fig. 9 shows roller 55 whose working surface 65 is divided up by a set of longitudinal 76 and annular 77 strips.

In all the types described in Figures 4-9, the smooth non-diamond coated strips can be replaced by grooves, or vice

5 versa.

The centre distance between strips or grooves can be constant or varied as preferred, on any one roller or on one roller and another.

On any one roller there may be strips without diamond powder coating and grooves.

The diamond coated surface may include areas with granules of different sizes and possessing different characteristics. The purpose of everything explained above is to produce particular effects on the appearance and colour of the fabric, as circumstances and preferences may require.

15 Lapping stages may be one or more, each with four, six or eight lapping rollers.

Movement of these rollers may also be transversal.

The number of roller turns, their direction of rotation, clearance angle between fabric and lapping roller, tension of the fabric and speed of movement can all be regulated. The fabric can be treated on both sides simultaneously. All operating parameters are connected to a microprocessor so that they can be repeated as needed.

25 Speed of regulation can be adjusted over a wide range, for example from 10 to 30 m/min.

Claims

1. Process for continuous change in surface appearance and colour of textile fabrics generally characterized in that the fabric (41) kept under tension,
5 passes round the rollers (23-26, 50-55) of a lapping unit (20) whose working surfaces (60-65) are formed of a coating (35, 60-65) of powdered diamonds.
2. Process as in claim 1 characterized in that the powdered diamond coating (35,
10 60-65) is applied to the surface (34) of the roller (23-26, 50-55) by electrodeposition.
3. Process as in claim 1 characterized in that the granules of the diamond powder are chosen in the shapes and sizes most suitable for the
15 abrasive action required.
4. Process as in claim 1 characterized in that the fabric (41) is treated dry.
5. Process as in claim 1 characterized in that the fabric (41) is treated wet.
- 20 6. Process as in claim 5 characterized in that for wet treatment of the fabric (41), before passing through the lapping unit (20) with coating (35, 60-65) of powdered diamond, the fabric (41) passes through a bath containing a liquid product.
- 25 7. Process as in claim 6 characterized in that the liquid product is water.
8. Process as in claim 6 characterized in that the liquid product used for wet treatment comprises substances suitable for achieving,
30 in synergy with the abrasive action of the coating (35, 60-65) of diamond granules, special effects on the fabric (41) so treated.

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9. Process as in claim 1
characterized in that some of the rollers (23-26,50-55)
are motor-driven.

10. Process as in claim 1
5 characterized in that the number of diamond-coated rollers (23-26,50-55), around which the fabric is made to pass, may be varied as desired according to the results to be obtained.

11. Process as in claim 1
10 characterized in that the speed at which one or another of the rollers (23-26,50-55) turns may be varied according to the results to be obtained.

12. Process as in claim 1
characterized in that the direction of rotation of all
15 the rollers (23-26,50-55) or of some of them, can be reversed in all.

13. Process as in claim 1
characterized in that the angle of clearance between the
fabric (41) and the rollers (23-26, 50-55) may be varied
20 according to the results to be obtained.

14. Process as in claim 1
characterized in that the pull on the fabric (41) can be
varied to establish the most suitable tension for it.

15. Process as in claim 1
25 characterized in that the speed at which the fabric (41) moves forward can be varied as desired.

16. Process as in claim 1
characterized in that action of the lapping rollers (23-26,
50-55) is carried out simultaneously on both sides of the
30 fabric (41).

17. Process as in claims 4-16
characterized in that all the working parameters chosen

- 10 -

can be memorized in a specially made electronic programming device to permit such parameters to be repeated.

18. Process as in claim 1

characterized in that the working surfaces (60-65) of
5 the lapping rollers (23-26, 50-55) is so generated as to
have working areas of different shape and size separated
by spaces (70-77) generally, abrasive action thereby being
made more effective due to the presence of edges,
which may be sharp, of raised areas higher than the spaces
10 which facilitates discharge of detached particles after
abrasion and, in the case of wet treatment, assists distribution
of the liquid product and makes possible determination
of treated and untreated areas in the fabric
and produces original decorative effects.

15 19. Process as in claim 18

characterized in that the spaces between the abrasive
areas are strips (70, 72, 73, 76, 77) on which there is no
diamond coating.

20. Process as in claim 18

20 characterized in that the spaces between the abrasive
areas are grooves (71, 74, 75) in the surface of the roller
(23-26, 50-55).

21. Process as in claim 20

characterized in that the grooves are diamond-coated.

25 22. Process as in claim 20

characterized in that the grooves (71, 74, 75) are not diamond-coated.

23. Process as in claims 19 and 20

30 characterized in that the strips (70, 76) and grooves (71)
are longitudinal.

24. Process as in claims 19 and 20

characterized in that the strips (72, 77) and the grooves

- 11 -

are annular and have equal or different centre distances one purpose of this being to create, in the fabrics (41), treated areas separated from untreated areas.

25. Process as in claims 19 and 20

5 characterized in that the strips (72) and the grooves are helical.

26. Process as in claims 19 and 20

characterized in that the strips and the grooves are in helical pairs (74,75) laid in opposite directions and
10 which cross over one another, one purpose of this being to facilitate a satisfactory discharge flow of particles detached by abrasion and to assist distribution of liquid when the treatment is a wet treatment.

27. Process as in claims 19 and 20

15 characterized in that the strips and grooves are both longitudinal (76) and annular (77) crossing freely.

28. Rollers (23-26,50-55) on whose surfaces diamond powder is laid by electrodeposition in order to carry out a process for continuous modification of the appearance
20 and colour of fabrics (41) as described in the preceding claims.

29. Machine (10) with one or more sections (20) each with lapping rollers (23-26,50-55) and having a coating (35,60-65) of diamond powder for modification of the appearance
25 pearance and colour of fabrics (41) by means of the process and the rollers (23-26,50-55) described in the preceding claims 1-28.

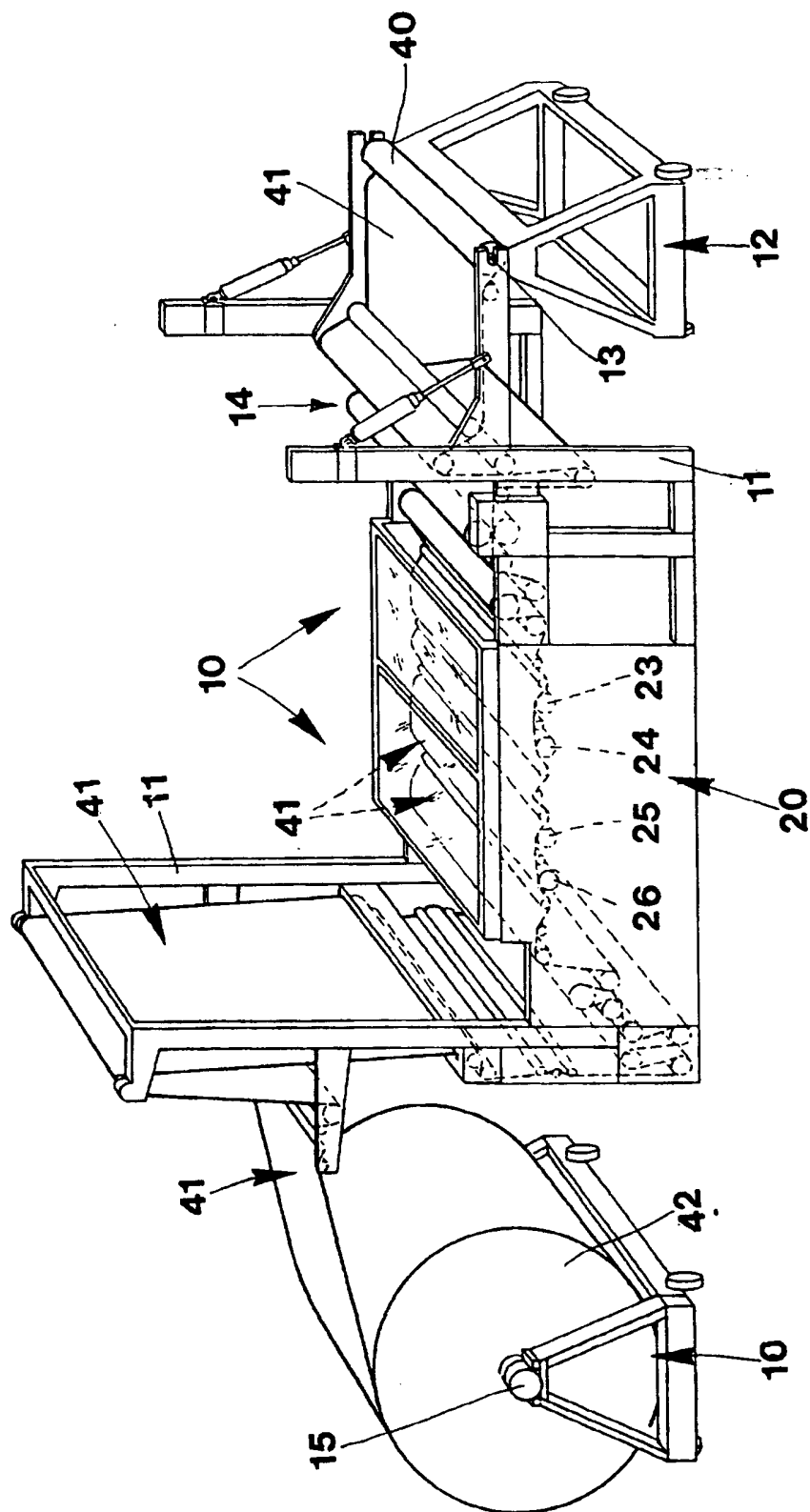


fig. 1

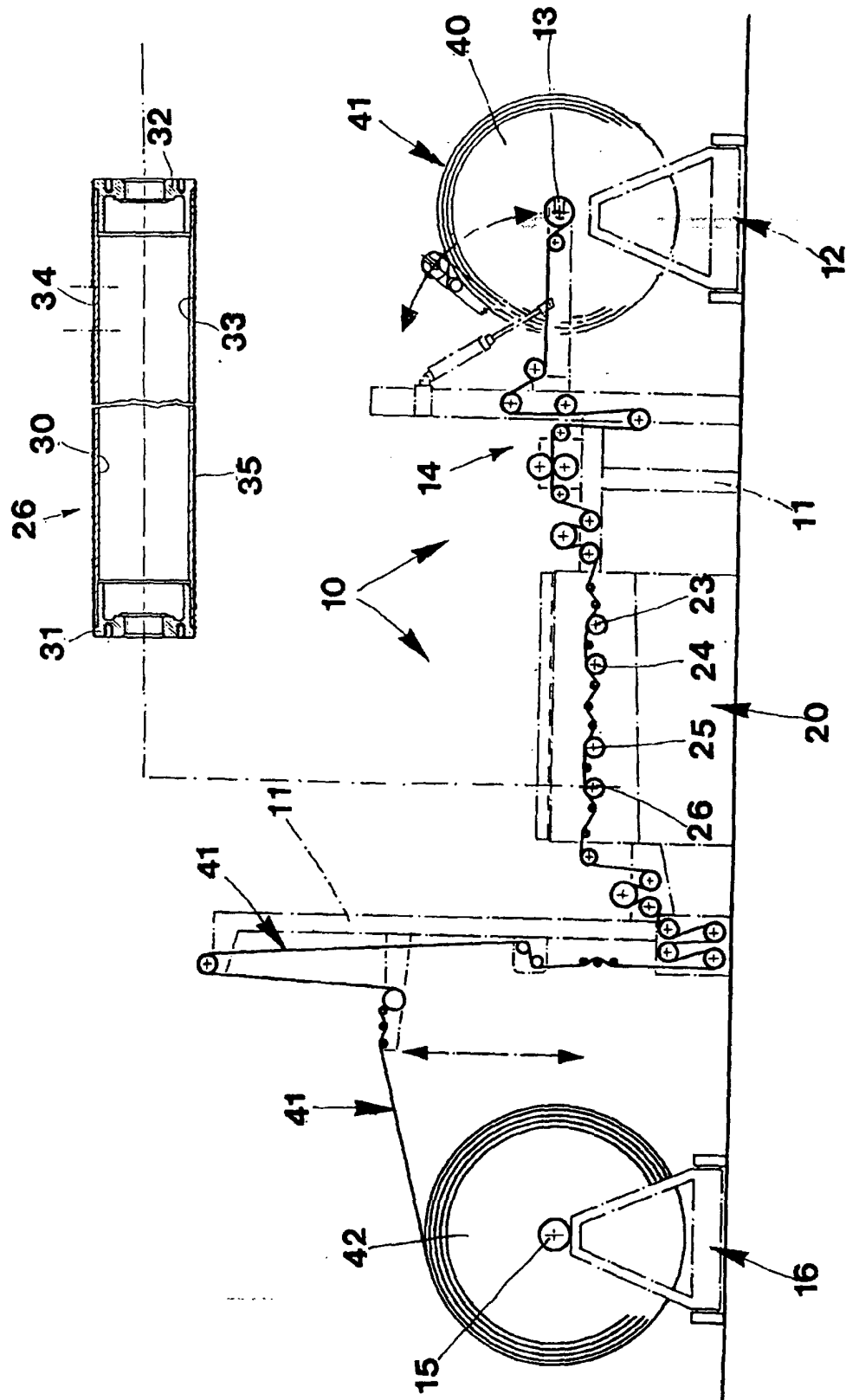


fig. 2

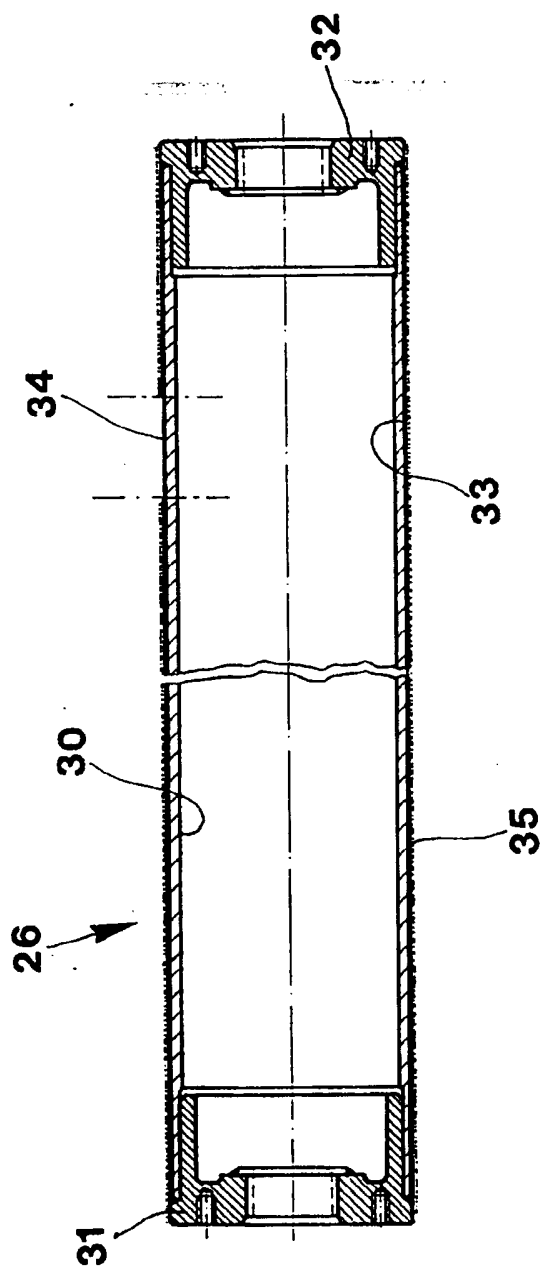


fig. 3

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fig. 4

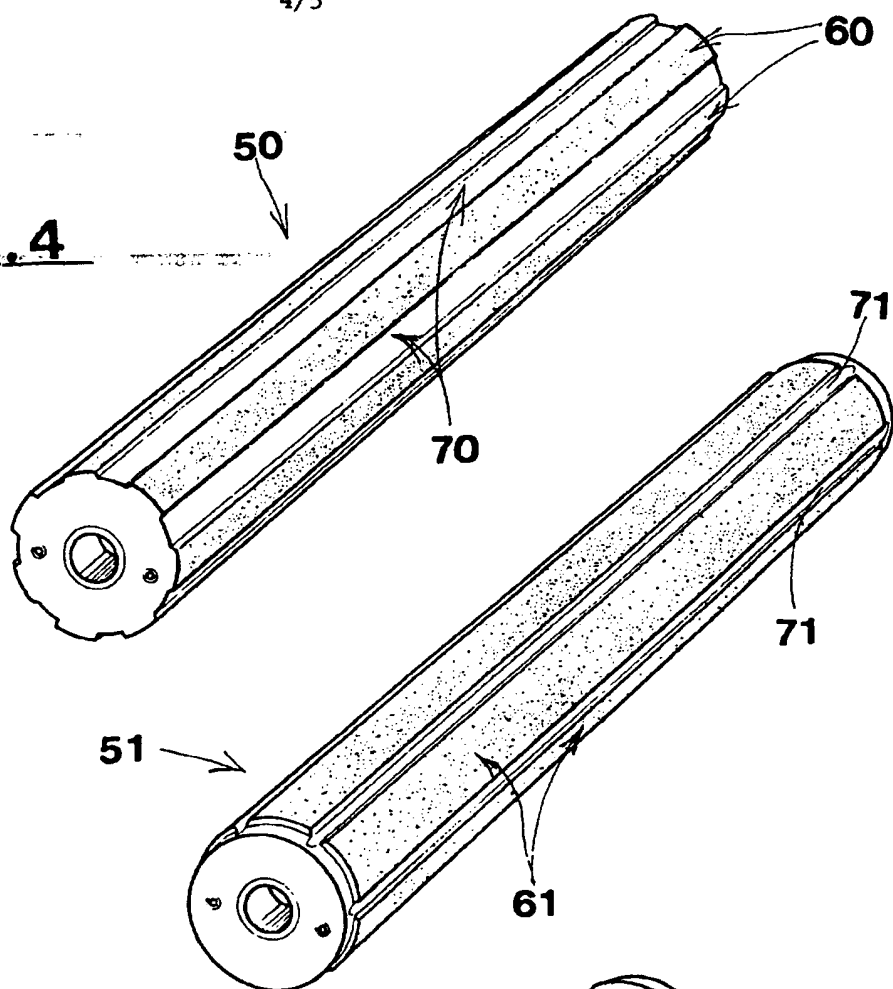


fig. 5

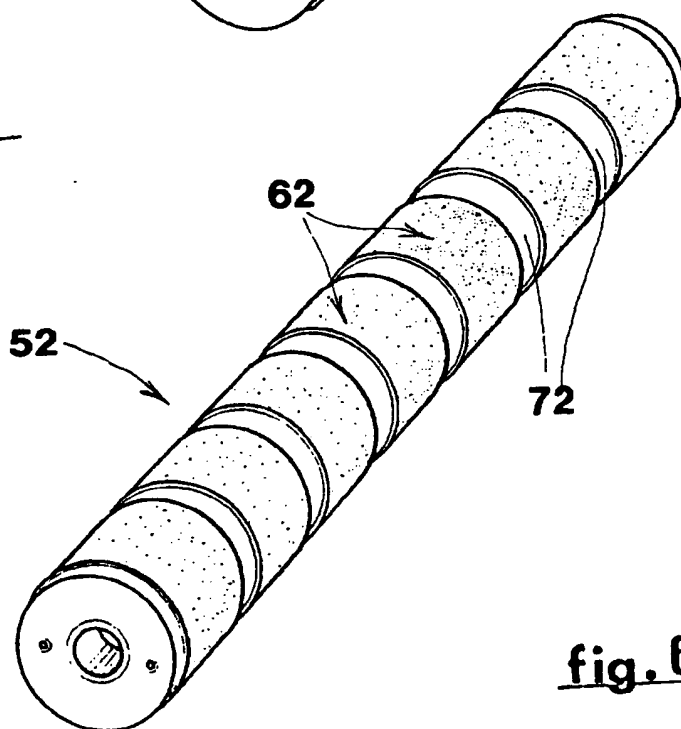


fig. 6

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fig. 7

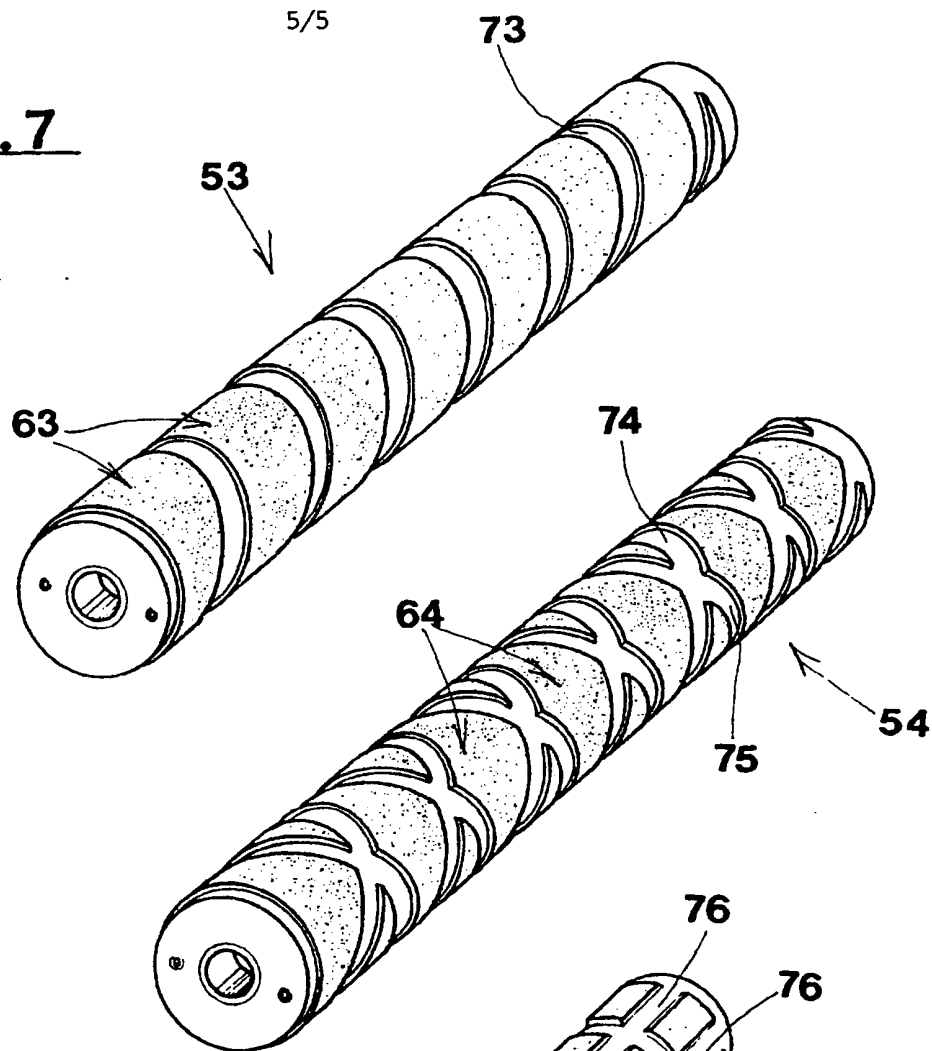


fig. 8

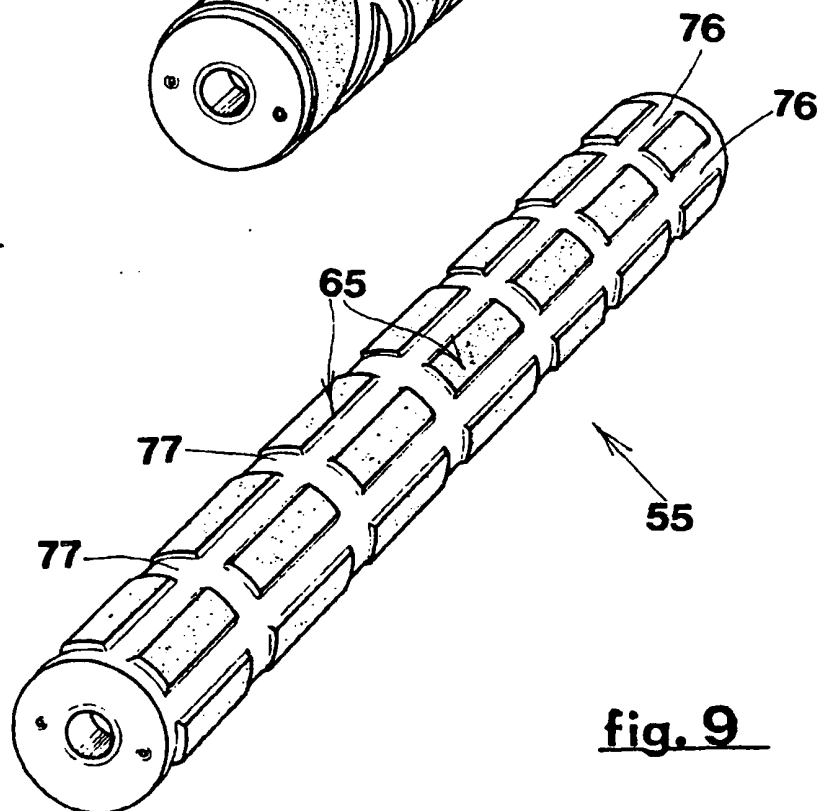


fig. 9

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 95/00228

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D06C11/00 D06B11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 D06C D06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 620 307 (SPEROTTO RIMAR S.P.A.) 19 October 1994 see column 2, line 9 - column 4, line 5 ---	1,5-10, 12,13, 28,29
X	EP,A,0 665 318 (SPEROTTO RIMAR S.P.A.) 2 August 1995 see column 2, line 1 - column 51 see column 3, line 53 - column 4, line 11 see column 4, line 28 - line 58 ---	1,5,9, 12-14, 18,20, 25,28,29
A	US,A,3 553 801 (W.N.HADLEY) 12 January 1971 see column 2, line 27 - column 3, line 33 see column 4, line 19 - line 35 -----	1,4,9, 12-14, 18,20,25

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

International Application No

PCT/IT 95/00228

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0620307	19-10-94	US-A- 5392499	28-02-95
EP-A-0665318	02-08-95	BR-A- 9500342	17-10-95
US-A-3553801	12-01-71	NONE	